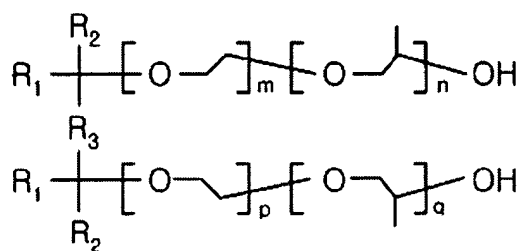## WHAT IS CLAIMED IS:

1.   A cleaning solution comprising:
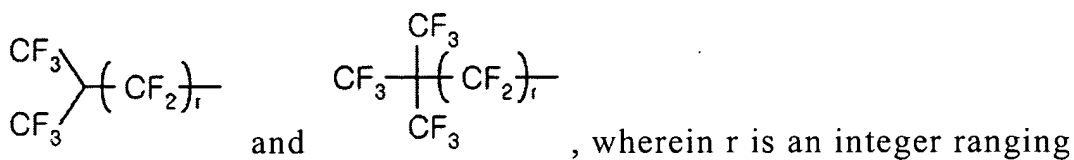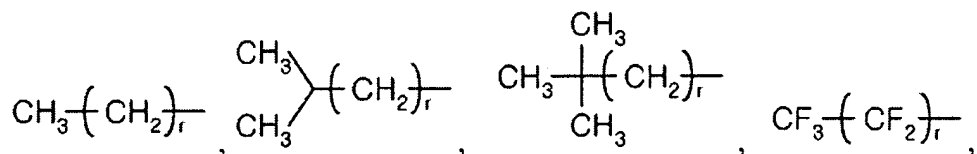
deionized water; and

5   a surfactant represented by the following formula:

$$R_1 \underset{R_3}{\overset{R_2}{\mid}} \left[O \diagdown \right]_m \left[O \diagup \right]_n OH$$

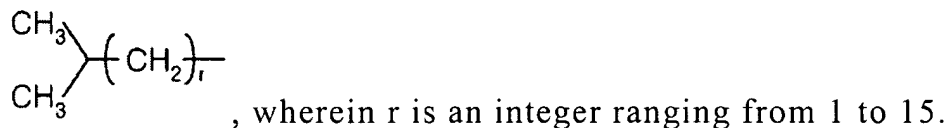$$R_1 \underset{R_2}{\overset{R_3}{\mid}} \left[O \diagdown \right]_p \left[O \diagup \right]_q OH$$

wherein R_1 and R_3 are carbides or fluorocarbons having 1 to 20

carbons, R_2 is hydrogen or carbide, m+p is an integer ranging from 1 to

10   30, n+q is an integer ranging from 0 to 10.

2.   The cleaning solution as claimed in claim 1, wherein R_1 is

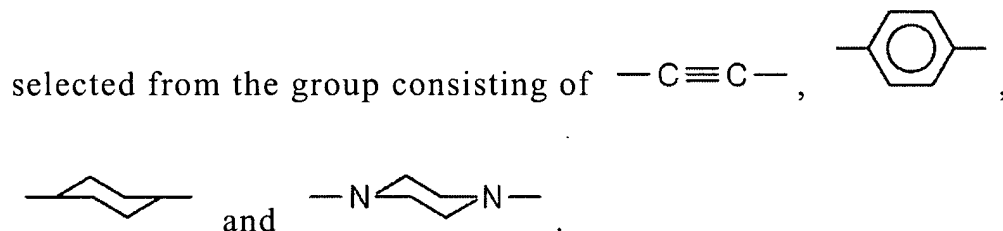selected from the group consisting of a methyl group,

$$CH_3 \left(CH_2 \right)_r \text{—} , \quad \overset{CH_3}{\underset{CH_3}{\diagup}} \left(CH_2 \right)_r \text{—} , \quad CH_3 \overset{CH_3}{\underset{CH_3}{\mid}} \left(CH_2 \right)_r \text{—} , \quad CF_3 \left(CF_2 \right)_r \text{—} ,$$

$$\overset{CF_3}{\underset{CF_3}{\diagup}} \left(CF_2 \right)_r \text{—} \quad \text{and} \quad CF_3 \overset{CF_3}{\underset{CF_3}{\mid}} \left(CF_2 \right)_r \text{—} \quad , \text{ wherein r is an integer ranging}$$

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from 1 to 15.

3.   The cleaning solution as claimed in claim 1, wherein R_2 is

selected from the group consisting of hydrogen, a methyl group, an ethyl

group, a propyl group, an isopropyl group, CF_3, CF_3CF_2 and

$$CH_3\!\!\diagdown\!\!\underset{CH_3}{\overset{}{\diagup}}\!\!\diagup\!\!(CH_2)_r\!\!-$$

, wherein r is an integer ranging from 1 to 15.

4.   The cleaning solution as claimed in claim 1, wherein R_3 is

selected from the group consisting of $-C\!\equiv\!C-$, ⟨benzene ring⟩ ,

⟨cyclohexane⟩ and $-N\!\!\diagup\!\!\diagdown\!\!N-$.

5.   The cleaning solution as claimed in claim 1, further

comprising an anionic surfactant containing fluorine or a nonionic

surfactant containing fluorine.

6.   The cleaning solution as claimed in claim 5, wherein the

nonionic surfactant containing fluorine is $R_fCH_2CH_2O(CH_2CH_2O)_XH$,

wherein X is an integer ranging from 0 to 20 and R_f is $F(CF_2CF_2)_Y$, and

wherein Y is an integer ranging from 1 to 10.

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7.   The cleaning solution as claimed in claim 5, wherein the anionic surfactant containing fluorine is ammonium perfluoroalkylethoxy phosphorate.

8.   The cleaning solution as claimed in claim 5, wherein the anionic surfactant containing fluorine or the nonionic surfactant containing fluorine is about 0.01 to about 1.0 wt.% based on a total weight of the deionized water.
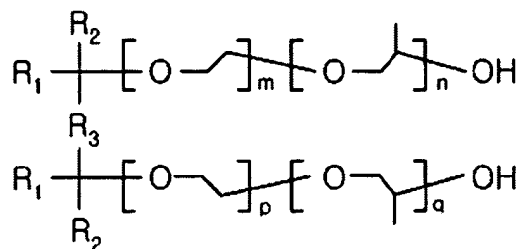
9.   The cleaning solution as claimed in claim 1, wherein the surfactant is about 0.01 to about 1.0 wt.% based on a total weight of the deionized water.

10.   A method for cleaning photoresist patterns on a semiconductor substrate, comprising the steps of:
    providing a semiconductor substrate having photoresist patterns;
    depositing deionized water on the photoresist patterns such that the photoresist patterns are substantially or completely covered with the deionized water;
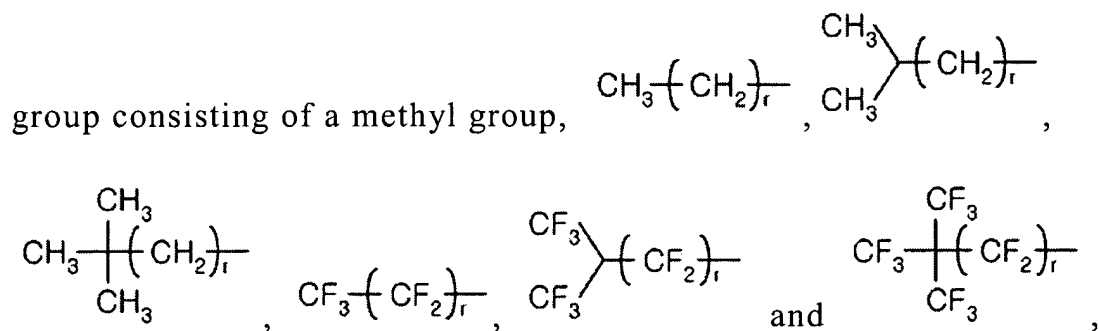   spinning the semiconductor substrate at about 500 rpm or less;
    depositing a cleaning solution on the photoresist patterns, wherein the cleaning solution comprises deionized water and a surfactant represented by the following formula:

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$$R_1 \begin{array}{c} R_2 \\ | \\ | \\ R_3 \end{array} [O \diagup]_m [O \diagup]_n OH$$

$$R_1 \begin{array}{c} R_3 \\ | \\ | \\ R_2 \end{array} [O \diagdown]_p [O \diagdown]_q OH$$

wherein R_1 and R_3 are carbides or fluorocarbons having 1 to 20

carbons, R_2 is hydrogen or carbide, m+p is an integer ranging from 1 to

30, n+q is an integer ranging from 0 to 10; and

5   spinning the semiconductor substrate to remove the cleaning

solution.

11.   The method of claim 10, wherein R_1 is selected from the

group consisting of a methyl group, $CH_3 \text{-}(CH_2)_r\text{-}$, $\begin{array}{c} CH_3 \\ \diagdown \\ CH_3 \diagup \end{array} (CH_2)_r\text{-}$,

$CH_3 \text{-} \begin{array}{c} CH_3 \\ | \\ | \\ CH_3 \end{array} (CH_2)_r\text{-}$, $CF_3 \text{-}(CF_2)_r\text{-}$, $\begin{array}{c} CF_3 \\ \diagdown \\ CF_3 \diagup \end{array} (CF_2)_r\text{-}$ and $CF_3 \text{-} \begin{array}{c} CF_3 \\ | \\ | \\ CF_3 \end{array} (CF_2)_r\text{-}$,
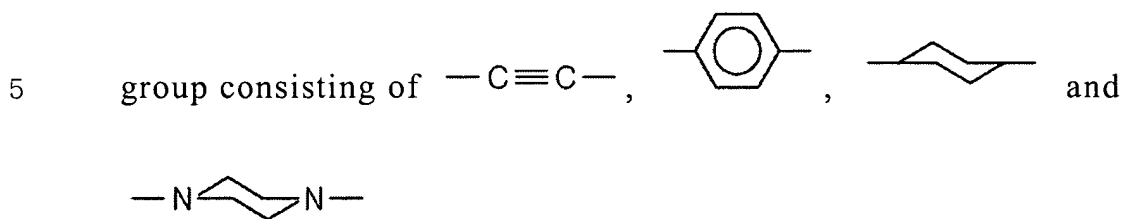
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wherein r is an integer ranging from 1 to 15.

12.   The method of claim 10, wherein the surfactant is about

0.01 to about 1.0 wt.% based on a total weight of the deionized water

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13.   The method of claim 10, wherein R_2 is selected from the

group consisting of hydrogen, a methyl group, an ethyl group, a propyl

group, an isopropyl group, CF_3, CF_3CF_2 and $(CH_3)_2CH(CH_2)_r-$, wherein r is an integer ranging from 1 to 15.

14. The method of claim 10, wherein R_3 is selected from the

group consisting of $-C{\equiv}C-$, ![benzene ring structure] , ![cyclohexane ring structure] and

$-N{\diagdown}{\diagup}N-$.

15. The method of claim 10, wherein the cleaning solution further comprises an anionic surfactant containing fluorine or a nonionic surfactant containing fluorine.

16. The method of claim 14, wherein the nonionic surfactant containing fluorine is $R_fCH_2CH_2O(CH_2CH_2O)_XH$, wherein X is an integer ranging from 0 to 20 and R_f is $F(CF_2CF_2)_Y$, and wherein Y is an integer ranging from 1 to 10.
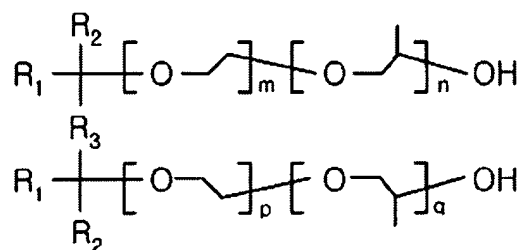
17. The method of claim 14, wherein the anionic surfactant containing fluorine is ammonium perfluoroalkylethoxy phosphorate.

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18.   The method of claim 14, wherein the anionic surfactant containing fluorine or the nonionic surfactant containing fluorine is about 0.01 to about 1.0 wt.% based on a total weight of the deionized water.

19.   A cleaning solution used for preventing the collapse of photoresist patterns formed on a semiconductor substrate during a dynamic state of a cleaning process which comprises deionized water and a surfactant at about 0.01 to about 1.0 wt.% based on a total weight of the deionized water, wherein the surfactant is represented by the following formula:
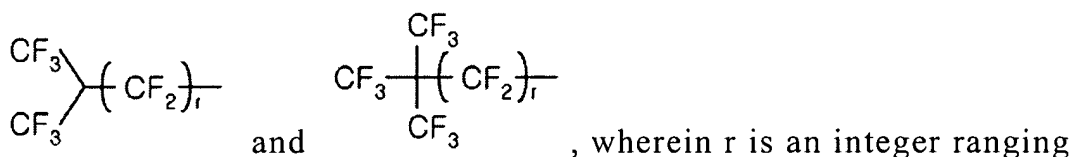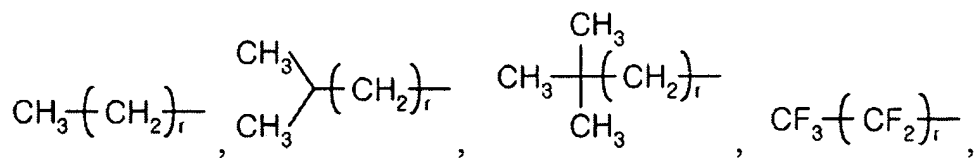
$$R_1 \underset{R_3}{\overset{R_2}{-}} \left[O - \right]_m \left[O - \right]_n OH$$

$$R_1 \underset{R_2}{\overset{R_3}{-}} \left[O - \right]_p \left[O - \right]_q OH$$

wherein R_1 and R_3 are carbides or fluorocarbons having 1 to 20 carbons, R_2 is hydrogen or carbide, $m+p$ is an integer ranging from 1 to 30, $n+q$ is an integer ranging from 0 to 10.
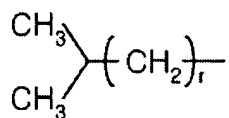
20.   The cleaning solution as claimed in claim 19, wherein R_1 is selected from the group consisting of a methyl group,

$$CH_3\!-\!(CH_2)_r\!- , \quad \begin{matrix} CH_3 \\ \diagdown \\ CH_3 \diagup \end{matrix}\!(CH_2)_r\!- , \quad CH_3\!-\!\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}\!(CH_2)_r\!- , \quad CF_3\!-\!(CF_2)_r\!- ,$$

$$\begin{matrix} CF_3 \\ \diagdown \\ CF_3 \diagup \end{matrix}\!(CF_2)_r\!- \quad \text{and} \quad CF_3\!-\!\overset{\displaystyle CF_3}{\underset{\displaystyle CF_3}{\overset{|}{\underset{|}{C}}}}\!(CF_2)_r\!- , \quad \text{wherein r is an integer ranging}$$
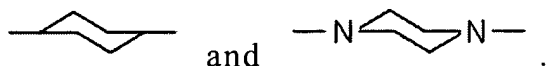
from   1 to 15.

21.   The cleaning solution as claimed in claim 19, wherein R_2 is selected from the group consisting of hydrogen, a methyl group, an ethyl group, a propyl group, an isopropyl group, CF_3, CF_3CF_2 and

$$\begin{matrix} CH_3 \\ \diagdown \\ CH_3 \diagup \end{matrix}\!(CH_2)_r\!- , \quad \text{wherein r is an integer ranging from 1 to 15.}$$

22.   The cleaning solution as claimed in claim 19, wherein R_3 is

selected from the group consisting of $-C\equiv C-$, ,

 and $-N\!\!\diagup\!\!\diagdown\!\!N-$.

23.   The cleaning solution as claimed in claim 19, further comprising an anionic surfactant containing fluorine or a nonionic surfactant containing fluorine.

5   24.   The cleaning solution as claimed in claim 23, wherein the nonionic surfactant containing fluorine is $R_fCH_2CH_2O(CH_2CH_2O)_XH$, wherein X is an integer ranging from 0 to 20 and R_f is $F(CF_2CF_2)_Y$, and wherein Y is an integer ranging from 1 to 10.

10   25.   The cleaning solution as claimed in claim 23, wherein the anionic surfactant containing fluorine is ammonium perfluoroalkylethoxy phosphorate.

26.   The cleaning solution as claimed in claim 23, wherein the
15   anionic surfactant containing fluorine or the nonionic surfactant containing fluorine is about 0.01 to about 1.0 wt.% based on a total weight of the deionized water.